

IN THE CLAIMS:

The following listing of claims will replace all prior listings of claims in the application:

1. (Previously Presented): A dedicated, hardware-based physics processing unit (PPU) that is coupled to an external memory, comprising:
 - an internal memory;
 - a floating point engine (FPE) that includes a vector processor adapted to perform multiple, parallel floating point operations to generate physics data, wherein the multiple, parallel floating point operations are specified by a very long instruction word (VLIW) that is issued to the FPE;
 - a PPU control engine (PCE) configured to control the overall operation of the PPU by allocating memory resources within the internal memory to the FPE and distributing commands received from a host central processing unit (CPU) to the FPE for processing;
 - a data movement engine (DME) configured to control the movement of data between the external memory and the internal memory in response to instructions received from the PCE; and
 - a data communication circuit adapted to communicate the physics data to the host CPU.
2. – 3. (Cancelled)
4. (Previously Presented): The PPU of claim 1, wherein the FPE performs the multiple, parallel floating point operations on data stored in the internal memory.
5. (Original): The PPU of claim 4, wherein the internal memory is operatively connected to the DME, and further comprising:
 - a high-speed memory bus operatively connecting an external high-speed memory to at least one of the DME and the FPE.

6. (Original): The PPU of claim 5, wherein the internal memory comprises multiple banks allowing multiple data threading operations.
7. (Original): The PPU of claim 3, wherein the PCE comprises control and communication software stored in a RISC core.
8. (Original): The PPU of claim 5, wherein the internal memory comprises first and second banks, and wherein the DME further comprises:
 - a first unidirectional crossbar connected to the first bank;
 - a second unidirectional crossbar connected to the second bank; and,
 - a bi-directional crossbar connecting first and second crossbars to the external high-speed memory.
9. (Previously Presented): A system, comprising:
 - a central processing unit (CPU);
 - an external memory storing data;
 - a dedicated, hardware-based physics processing unit (PPU) coupled to the CPU and the external memory and comprising:
 - an internal memory,
 - an application specific integrated circuit (ASIC) implementing a vector processor adapted to perform multiple, floating point operations, wherein the multiple, parallel floating point operations are specified by a very long instruction word (VLIW) that is issues to the vector processor,
 - a PPU control engine (PCE) configured to control the overall operation of the PPU by allocating memory resources and distributing commands received from a host central processing unit (CPU) to the FPE, and
 - a data movement engine (DME) configured to control the movement of data between the external memory and the internal memory in response to instructions received from the PCE.

10. (Previously Presented): The system of claim 9, further comprising a personal computer (PC); and wherein the PPU comprises an expansion board adapted for incorporation within the PC, the expansion board mounting the ASIC and the external memory.

11. (Previously Presented): The system of claim 10, further comprising circuitry enabling at least one data communications protocol between the PPU and CPU.

12. (Previously Presented): The system of claim 11, wherein the at least one data communications protocol comprises at least one protocol selected from a group of protocols defined by USB, USB2, Firewire, PCI, PCI-X, PCI-Express, and Ethernet.

13. – 15. (Cancelled)

16. (Previously Presented): The system of claim 9, wherein the internal memory is operatively connected to the DME, and further comprising:

a high-speed memory bus operatively connecting the external memory to at least one of the DME and the FPE.

17. (Previously Presented): The system of claim 16, wherein the internal memory comprises multiple banks allowing multiple data threading operations.

18. (Previously Presented): The system of claim 17, wherein the internal memory further comprises:

an Inter-Engine memory transferring data between the DME and FPE.

19. (Previously Presented): The system of claim 18, wherein the internal memory further comprises:

a Scratch Pad memory.

20. (Previously Presented): The system of claim 14, further comprising a command packet queue transferring command packets from the PCE to the DME.
21. (Previously Presented): The system of claim 15, wherein the FPE comprises a plurality of vector floating-point units.
22. (Previously Presented): The system of claim 21, wherein at least one of the command packets defines a vector length of variable length.
23. (Previously Presented): The system of claim 15, wherein the DME comprises a plurality of memory control units (MCUs) and a switch fabric connecting the MCUs to the external memory; and,
 wherein the FPE comprises a plurality of vector processing engines (VPEs)
 receiving data from at least one of the MCUs via a VPE bus.
24. (Previously Presented): The system of claim 23, wherein each VPE comprises a plurality of vector processing units (VPUs) receiving data from the VPE bus.
25. (Previously Presented): The system of claim 24, wherein each VPU comprises:
 a dual bank inter-engine memory (IEM) receiving data from the VPE bus;
 one or more data registers receiving data from the IEM under the control of an
 associated load/store unit; and
 an execution unit performing parallel floating point operations.
26. (Previously Presented): The system of claim 23, wherein at least one command packet received from the PCE defines a vector length of variable length.
27. (Previously Presented): The system of claim 23, wherein the switch fabric comprises at least one crossbar circuit.

28. (Previously Presented): The system of claim 24, wherein each VPU is dynamically re-configurable.